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Original Articles

An Evaluation of Peer and Professional Trainers in a Union-Based Occupational Health and Safety Training Program

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Social cognitive theory posits that behavior can be changed by observing others perform or describe performance of behaviors. This framework was applied to understanding health behavior change associated with workplace health and safety training. Questionnaires were developed and administered to 426 workers at a United Automobile Worker's Union health and safety training program. Participants received training from one of three trainers: (1) local union discussion leaders (LUDLs), (2) professional staff trainers, or (3) LUDLs with professional staff trainers. Data were collected in three phases: before, after, and three months post-training. Findings show that subjects trained by LUDLs identify most closely with their instructors, whereas subjects trained by staff trainers identify least closely with them. In addition, workers trained by LUDLs reported changing behavior as a result of training more often than workers trained by others.

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Training of workers has received increasing recognition as a key component in ensuring the health and safety of the US workforce. A number of current federal standards promulgated by the Occupational Health and Safety Administration require employee training as a central aspect, including notably the Hazard Communication Standard and Hazardous Waste Standard. For the most part, these are performance standards that require training but do not specify in detail the methods to be used. In particular, the person who is to perform the training is not specified. Peer training, which is an educational method by which a worker (peer) teaches other workers, is attractive to employers because it helps to keep personnel-associated training costs down and increases the likelihood that trainers will

have specific knowledge of hazardous conditions faced by workers. Moreover, in unionized settings, the use of peer trainers who include union members is attractive to unions that wish to ensure that the membership's viewpoints are incorporated into training.

A review of existing literature on training in the workplace indicates that although a substantial number of training programs have included peer trainers, [1] [2] [3] no studies have specifically tried to evaluate the efficacy of peer training in comparison to training conducted by health and safety professionals.

Training programs that use peer trainers typically include a train-the-trainer component [1] [2] [3] [4] [5] to ready peer

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trainers for their responsibilities. One of the basic premises for development of such program components is that peers, once they receive proper training on how to teach, will return to their workplace and provide effective training for their fellow workers. It has long been acknowledged that peers, or insiders, can greatly influence the behaviors of others in their peer group. [6] Although little research has been performed on peer training in the workplace, credence for this approach stems from prior research with classroom teachers [7] and institutional direct care staff. [8] However, there are no published studies directly comparing workplace programs conducted by peer trainers vs those conducted by professional trainers.

Social cognitive theory, also known as social learning theory, is useful for understanding the effect of training programs on health-related behaviors such as workplace health and safety behaviors because it addresses the mechanisms promoting behavior change as well as the psychosocial dynamics of that change. Social learning views behavior change as dependent upon interactions that occur in an interlocking model in which behavior, personal factors, and environmental factors all work together. [9] Thus an individual's behavior is uniquely influenced by the relationship between these factors. [10] Knowledge, component skills, and transformational operations are necessary but insufficient for accomplished performances. [11] People often do not exhibit exemplary behaviors even though they know what to do. This may be due to the process of self-referent thought in psychological functioning [11] [12] known as self-efficacy (ie, the person must have the belief that they can effectively carry out the behavior). Seeing others who are regarded as similar to oneself successfully perform activities can raise percepts of efficacy in observers that they too can perform comparable activities. A concept distinct from self-efficacy under social cognitive theory is that of outcome efficacy. Outcome efficacy is the individual's belief that performance of certain behaviors will result in certain outcomes. Social cognitive theory suggests that when a person is seen as more knowledgeable about certain behaviors, then his/her influence on a person's belief in the outcome of such behaviors is anticipated to be greater than the influence exerted by a less-knowledgeable individual. Both reasonable level of belief in self-efficacy and outcome efficacy concerning a set of certain behaviors will be necessary for the individual to actually adopt such behaviors. These posits of social cognitive theory are directly applicable to a comparison of the effect of peer training vs professional training. They were applied in the current study to a union-based health and safety training program.

The United Automobile Worker's Union (UAW) conducted a multi-site program designed to provide UAW members with the knowledge and skills needed to recognize and prevent exposure to job hazards. Training is provided by two types of trainers: full-time professionals from the UAW International Health and Safety Department, and peer trainers known as local union discussion leaders (LUDLs). LUDLs were selected by regional directors of the union for their prior experience in workplace health and safety to take part in a train-the-trainer program to become peer trainers. LUDLs are not expected to become

full-time trainers and continue to hold their current positions at their plants. LUDLs do, however, receive compensation for their training activities. Rigorous training in adult-education techniques was provided to the LUDLs as part of the train-the-trainer program by the Institute for Labor and Industrial Relations at the University of Michigan.

For training to be conducted at a worksite or local, a request must be made through the regional director for that area and given to the UAW International Health and Safety Staff. Either a professional staff trainer(s), LUDL(s), or a staff trainer in conjunction with a LUDL may conduct the training session. It is important to note that the type of trainer to be used is not predetermined in an organized fashion but is instead determined by need of training, availability of a trainer, and location of the training. When a LUDL is involved in conducting a session, the LUDL usually takes leave from his/her employer and travels to a different local union to conduct classes in that union hall, plant facility, or at another union facility.

The UAW training program is designed to motivate members to become active participants in health and safety programs at their individual facilities. The trainer acts as a facilitator to guide participants through a combination of lecture, group exercises, and discussions. Anywhere from eight to 40 participants can make up a class. After introductions are completed, participants receive a packet of relevant handouts to complete a variety of exercises (all handouts were developed or adopted by the UAW specifically for their training programs). The instructor acts as a facilitator for small and large group discussion and guides trainees through the exercises. Often, small group problem solving is used as a means to bring about larger group discussions. Interaction among students is encouraged at all times. In addition, personal experiences of participants are often used to promote learning. If appropriate, hands-on demonstrations are used. Finally, audiovisual aids such as video tapes and slides may be used for certain sessions. The general format of the training and the materials used are constant across the type of trainer (s) conducting the sessions.

Based on the model of social cognitive theory, a priori, we posited three main hypotheses:

1. Workers receiving training from peer trainers (LUDLs) will demonstrate

   greater increases in self-efficacy for the modeled behaviors than will workers trained by UAW professional staff.
2. Workers receiving training from UAW professional staff will demonstrate greater increases in outcome efficacy for the modeled behaviors than LUDL-trained workers.
   Also, based on the belief that changes in self-efficacy were likely to be more critical than changes in outcome efficacy in this setting:
3. LUDL-trained workers will demonstrate greater positive behavioral changes than workers trained by professional staff.

Hypothesis 1 follows from the expectation under social cognitive theory that perceptions of self-efficacy can be raised by observing others who are regarded as being similar to oneself perform certain activities. Because LUDLs are part of the UAW rank and file (training is not their full time job, LUDLs work on the "line" like the trainees), they are expected to have many of the same experiences on-the-job and beliefs about their work as trainees. For these reasons, trainees are expected to identify more closely with LUDLs than with the staff trainers. Hypothesis 2 follows from the expectation that staff trainers, because of their rank and authority within the UAW hierarchy, are expected to be perceived as particularly credible and knowledgeable about health and safety activities. Hypothesis 3 is based upon

the authors' expectation that in this particular setting, relatively low self-efficacy would be a greater impediment to behavior change than outcome efficacy, which was expected to be viewed as relatively high by most participating workers.

Methods

The current study design was constrained by the requirement that it work within the already-developed structure of the UAW training program. Workers were classified into three groups on the basis of who conducted the training the individual worker received: LUDL-trained, staff-trained, LUDL/staff-trained (ie, both types of trainers involved). In this study, the group trained by a peer trainer alone is compared with the groups trained by staff trainers and staff and peer trainers.

Data were collected for all training programs conducted from March 1993 to December 1993 (a total of 16 different sites). Training was conducted by professional trainers at seven sites, by LUDLs at five sites, and by professional trainers with LUDLs at five sites. Final subject counts for each group were 193 trained by LUDLs, 97 trained by staff, and 136 trained by LUDLs with staff. Most sites represent individual training programs at local sites that lasted for one or two days with a maximum of four hours of training per day. However, three sites had training programs that lasted from four to five days (site 1, site 5, and site 14). Site 1 was a central union training facility where workers received training in a number of areas over a period of one week. Students attended morning and afternoon sessions during this week on a number of health and safety related topics. Training was conducted by LUDL trainer(s) and LUDL/staff trainer(s). At this site, data were collected during specific morning or afternoon sessions that covered one of the selected topics for this study. Two additional sites (site 12, site 15) differed from the majority of study sites in that non-UAW members were in attendance as well. Data were collected for all trainees at these sites, however, *only* data for UAW members are presented here.

Data were collected through self-administered questionnaires that were distributed by one of the researchers at two sites (site 1, site 2) and by the instructors at all other sites. It was necessary for instructors to collect data because training sites for this study were located throughout the United States. Data were collected from participants at three points in time: immediately prior to training (time 1), immediately after training (time 2), and three months after training (time 3). Except for sites 1 and 11, participants completed a brief one-page questionnaire prior to any training to establish baselines (time 1). Questions focused on components of self-efficacy, outcome efficacy, and safety behavior. At site 1, collection prior to training was not approved. At site 11, the instructor forgot to administer the baseline surveys. At the end of each training program, a longer questionnaire was administered to all participants (time 2). In addition to questions on self-efficacy and outcome efficacy, a number of questions about plant attitudes toward safety and prior safety-related experiences were asked. Three months after the initial training program, a follow-up survey was sent by mail to all participants (time 3). Collection of post-training data by mail survey was necessary because the trainee population for this study was made up of UAW rank and file workers throughout the country.

The three survey instruments were designed for use in the current study by the researcher, University of Michigan faculty, and UAW staff. Each instrument contained the three main scales of measurement: self-efficacy, outcome efficacy, and self-reported safety behavior. Because existent self-efficacy and outcome efficacy scales were not designed to specifically probe a person's confidence in his/her work-related safety behaviors, new scales were designed for the current study. The scale for safety behavior was a modified version of a previously developed survey used by the University of Michigan Occupational Health Program to evaluate UAW training programs for hazardous waste.

Data were analyzed using SPSS for Windows statistical software (SPSS Inc., Chicago, Illinois). Similar

methods were used to analyze data at all three times. Factor analysis was performed for the three main outcome scales (self-efficacy, outcome efficacy, and behavior) to test for consistency. Composite scores for each scale were tabulated by summing a respondent's answers across all variables kept in the scale and taking the average. For the behavior scale, an answer of "Not Sure/Doesn't Apply" was counted as a missing value and was not included in the tabulation. Composite scores for the three scales were then used in further calculations. A fourth scale, climate, was included on the time two and time three questionnaires and was analyzed in the same manner. For this scale, an answer of "Not Sure/Doesn't Apply" was counted as a missing value and was not included in tabulations. For the self-efficacy scale, all respondents scored responses on a scale ranging from 1 ("Least Confident") to 7 ("Most Confident"). Composite scores were based on the following statements: (1) I can recognize health and safety hazards; (2) I know how to get needed information about health and safety hazards; (3) I know how to handle small spills at my work area; (4) I can make my own work practices safer; (5) I can provide leadership for health and safety activities; and (6) I can use the proper channels to demand that an unsafe working condition be improved. For the outcome-efficacy scale, all respondents scored responses on a scale ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree"). Composite scores were based on the following statements: (1) If I follow recommended health and safety practices I will be safe on the job; (2) If I use an MSDS/NJ Fact Sheet I can get needed hazard information about chemicals at my plant; (3) If a health and safety committee is active working conditions will be safer; (4) If I use personal protective equipment when it is necessary I will have fewer injuries on the job; (5) If I keep food away from my work area I can avoid accidental ingestion of chemicals; and (6) If my work area is neat and clean there will be fewer slips and falls. For the behavior scale, all respondents scored responses on a scale ranging from 1 ("Never") to 5 ("Always"). Composite scores were based on the following statements: (1) I avoid eating in my work area; (2) I wear the proper personal protective equipment when it is necessary; (3) My work clothes are washed with my street clothes; (4) I look at all relevant information before I begin working with a new material; (5) I avoid skin contact with materials I use at work; (6) I tell my supervisor if I think there is something wrong at my work station; (7) I tell my health and safety representative if I think there is something wrong at my work station; and (8) I avoid smoking in my work area. For the climate scale, all respondents scored responses on a scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). Composite scores were based on the following statements: (1) My co-workers encourage each other to follow recommended work practices when they work with hazardous materials; (2) My supervisor insists that we follow recommended work practices when we work with hazardous materials; (3) At my plant production is the most important thing; (4) Health and safety is considered secondary in my plant.

Demographic and other descriptive data were compared using one-way analysis of variance (ANOVA) analysis, the chi-square statistic, or the Mantel Haenszel test for linear trend, depending upon the answer category.

Two subgroups were defined as the following: all those who answered at time two but did not have time one data collected, and all those who answered at both time one and time two. Comparisons were made between each sub-group using the one-way ANOVA procedure, the chi-square statistic, or the Mantel Haenszel test for linear trend as appropriate.

Delta (change) scores were calculated as the difference between the composite score at the later time and the composite score at the earlier time for each respondent group and were compared across groups.

The relationship between variable level and outcome was tested using either the one-way ANOVA

procedure or the Mantel Haenszel test for linear trend as appropriate.

Finally, linear regression models were investigated for each outcome variable (self-efficacy, outcome efficacy, behavior). In cases in which interaction terms led to high degrees of collinearity, the terms were converted into deviation units and the model was recalculated.

Results

The study sample consisted of a total of 426 workers; 193 trained by LUDL trainers, 136 trained by LUDL/staff trainers, and 97 trained by staff trainers. During the initial phase of the data collection, no trainee refused to complete a questionnaire (time 1 baseline, and time 2 immediate post training). At two sites, baseline data were not collected (see "Methods"), resulting in the following worker distributions for the study: (1) Trainees with time 1 and time 2 data: 233, including 55 trained by LUDL trainers, 81 trained by LUDL/staff trainers, 97 trained by staff trainers; and (2) Trainees with time 2 data only (without time 1 data): 193, including 138 trained by LUDL trainers, and 55 trained by LUDL/staff trainers. Three months after the training, all trainees (n = 426) were sent a survey by mail. A total of 304 (71%) responded to the survey. This resulted in the following time 3 response distribution for the study: 127 trained by LUDL trainers, 105 trained by LUDL/staff trainers, and 72 trained by staff trainers.

Demographic, job-related, prior health-and-safety-experience-related, union-related experience, and ratings of current training variables

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TABLE 1 -- Demographic Comparisons by Trainer Group*

	Trainees with Time 1 and Time 2 Data (*n*= 233)				Trainees with Time 2 Data Only (*n*= 193)		
Variable	**LUDL (*n*= 55)**	**LUDL/Staff (*n*= 81)**	**Staff (*n*= 97)**	***P*Value**	**LUDL (*n*= 138)**	**LUDL/Staff (*n*= 55)**	***P*Value**
Mean Age	46.3	42.7	43.5	0.35 §	41.2	42.1	0.47 §
Race-% White	88.4	94.5	94.2	0.39 ‡	83.7	94.4	0.05 ‡
Sex-% Male	91.3	79.7	84.4	0.23 ‡	74.8	79.6	0.48 ‡
Education Level				0.02 †			0.55 ‡
% 11 Years or less or High School Grad.	43.5	54.5	31.5		41.2	43.4	
% Some College or Trade or Technical School	52.2	42.9	57.3		50.0	54.7	
% College Grad.	4.30	2.60	11.2		6.60	1.80	
Mean Years at Facility	14.11	13.3	14.2	0.78 §	13.1	16.1	0.03 §
Mean Years on Job	15.6	12.6	11.2	0.01 §	11.4	13.3	0.19 §

Job Category				0.36 ‡			0.18 ‡
% Skilled Trades	42.9	25.7	32.9		25.7	23.1	
% Production	44.9	59.5	50.6		59.4	71.2	
% Other Position	12.2	14.9	16.5		14.8	5.7	
Mean Years Worked with Hazardous Materials	3.12	3.32	3.51	0.04 †	3.26	3.47	0.25 †
Mean Score-Level of Job Hazard	2.84	2.91	2.82	0.79 †	3.03	2.87	0.31 †
Mean Score-Amount of Prior Training	2.44	2.40	2.97	<0.01 †	2.53	2.58	0.76 †
Mean Score-Level of Participation in Health and Safety Committee	2.86	2.72	3.76	<0.01 †	3.74	4.13	0.07 †
Hold Union Position % Yes	77.8	73.1	69.7	0.61 ‡	79.6	81.4	0.78 ‡
Mean Score-Level of Identity With Instructor	1.17	1.31	1.46	0.01 †	NA	NA	NA

* All mean values in the table were calculated using the ANOVA comparison of means procedure. For all variables except age, years at facility, years on the job, and level of identity with instructor, the following applies: greater mean scores indicate higher responses on the variable value- for example for the variable rating of union management relations, a mean score of 1 indicates a poorer rating than a mean score of 3. For the variable level of identity with instructor, lower mean values indicate a greater level of identity with the instructor than higher mean values. NA, not available.
§ Analysis of variance (ANOVA).
‡ chi^2 statistic.
† Mantel Haenszel test for Linear Association.

are compared by trainer group (LUDL, LUDL/staff, staff alone) in Table 1 . Among the 233 trainees for whom both time 1 (baseline) and time 2 data were available, age, percentage white, and percentage male were similar among the three groups. Significant differences in educational levels existed among the groups, being highest in staff-trained and lowest in LUDL/staff-trained. With respect to job-related variables, the three trainer groups were similar in job category, years working with hazardous materials, years working at current facility, and level of hazard. However, there were significant differences in years on the job. Workers trained by LUDL trainers had the most years on the job, whereas those trained by staff trainers had the least. With respect to safety-related experience, there were significant differences in amount of prior training and level of participation in a health and safety committee. Respondents trained by staff trainers were highest for these two variables. With respect to ratings of current training variables, no significant difference was found on how respondents in the three groups rated the presentation of training material, but significant differences were found for rating of the workshop and rating of the training setting, with LUDL trainees giving the highest ratings for both variables (results not shown). The three groups were similar with respect to holding a union position but differed significantly with respect to rating of union management relations, with LUDL-trained giving the highest ratings and staff-trained giving the lowest (results not shown). Finally, with respect to level of identity with their trainer, significant differences were present. Workers trained by LUDL trainers had the closest level of identity with their trainers, workers trained by LUDL/staff trainers had the next

closest level, and workers trained by staff trainers had the least close level of identity with their instructor.

The same variables described above are compared by trainer group (LUDL, LUDL/staff; note that there are no staff-trained subjects in this subgroup) in Table 1 for the group of workers for whom no baseline data could be collected. Among these 193 trainees, age, educational level, and percentage male were similar between the trainer groups. There was a slightly significant tendency for the

TABLE 2 -- Comparisons of Outcome Variable Values by Trainer Group *

Outcome Variable-Mean Scores	Trainees with Time 1 and Time 2 Data (*n*= 233) LUDL (*n*= 55)	LUDL/Staff (*n*= 81)	Staff (*n*= 97)	*P*Value †
Self-Efficacy ‡ Time 1	5.08	5.36	5.40	0.20
Self-Efficacy ‡ Time 2	6.12	5.74	5.96	0.02
Delta Self-Efficacy	+1.04 §	+0.38 §	+0.56 §	<0.0005
Outcome Efficacy ‡ Time 1	6.04	5.64	5.85	0.05
Outcome Efficacy ‡ Time 2	6.18	5.77	6.06	0.01
Delta Outcome Efficacy	+0.14	+0.13	+0.21 ‖	0.88
Behavior Time ‡ 1	4.07	3.98	4.25	0.04
Behavior Time ‡ 2	4.20	3.92	4.30	<0.001
Delta Behavior	+0.13	-0.06	+0.05	0.15

* Delta values = value at time 2 - value at time 1.

† Based on ANOVA comparing means of the three groups.

‡ See "Methods" for definitions of these composite variables.

§ $P < 0.001$ for Delta differing from phi, using paired *t* test.

‖ $P < 0.05$.

LUDL-trained group to be less likely to be white. With respect to job-related variables, the groups were similar for job category, years on the job, level of job hazard, and years of experience working with hazardous materials. However, LUDL/staff-trained workers spent significantly more years working at their facility than LUDL-trained workers. No differences were found with respect to union-related activities (rating of union management relations, holding a union position). There was no significant difference between the groups for levels of prior safety training. Finally, with respect to ratings of current training variables, no significant differences were found between the two groups.

With respect to the hypothesis that workers trained by LUDL trainers would exhibit greater increases in

self-efficacy than workers trained by another type of trainer (staff or LUDL/staff), LUDL-trained workers exhibited significantly greater increases in self-efficacy scores from time 1 to time 2 than the workers in other groups (Table 2) . In addition, LUDL-trained workers also exhibit the greatest increases in self-efficacy scores from time 1 to time 3 (Table 3) . *T*-test results show a significant difference between time 1 and time 2 scores (Table 2) and between time 1 and time 3 scores (Table 3) on self-efficacy for LUDL-trained workers. Multivariable analyses indicate that being a LUDL trainer is associated with greater changes in self-efficacy scores from time 1 to time 2 than LUDL/staff trainers, but there is no significant difference with staff-trained subjects (Table 4) . This model was also considered with "Identity with Instructor," and "Rate Workshop" as covariates, which resulted in similar *P* values and coefficients (results not shown). Additional multivariable models indicate that being a LUDL trainer is significantly associated ($P = 0.006$) with higher Delta self-efficacy time 2-time 1 scores than for any other type of trainer (not shown), and that being a LUDL trainer is associated with the highest self-efficacy scores at time 3 (Table 5) . For the model that includes time 1 results (Table 5) to predict time 3 values, the interaction term between self-efficacy at time 1 and LUDL trainer type was significant ($P = 0.011$). An evaluation of this model using plausible time 1 self-efficacy scores (results not shown) shows that LUDL-trained workers have the highest predicted self-efficacy scores, particularly so if their scores were high at time 1.

With respect to the second hypothesis, that workers trained by staff trainers would exhibit greater increases in outcome efficacy than workers trained by any other type of trainer (LUDL, LUDL/staff), staff-trained workers exhibit a marginally greater (nonsignificant) change in outcome-efficacy scores from time 1 to time 2 (Table 2) than workers trained by others. *T*-tests show a significant difference in outcome efficacy scores from time 1 to time 2 for staff-trained workers (Table 2) but not when time 1 and time 3 are compared (Table 3) . Multivariable analyses indicate that being a staff trainer is associated with significantly greater changes in outcome-efficacy scores from time 1 to time 2 than with LUDL/staff trainers, but there is no significant difference with LUDL-trained subjects (Table 4) . At time 3, there are no significant differences among these three groups.

Finally, with respect to the third hypothesis that workers trained by LUDL trainers would exhibit greater changes in safety behavior than workers trained by any other type of trainer (staff, LUDL/staff), in a question at time 3 simply asking whether the respondent now performed his or her job differently because of the training, LUDL-trained workers were significantly more likely to answer "yes" than staff- or LUDL/staff-trained workers (87%, 71%, 76%, respectively; $P = 0.02$). However, in the analysis presented in Tables 3 and 5 , LUDL-trained workers were never significantly more likely to change behavior than other workers between time 1 and time 3 or time 2 and time 3 (note that changes between times 1 and 2 could only represent perceptual artifacts because no opportunity had yet been afforded to change behavior).

TABLE 3 -- Comparisons of Outcome Variables by Trainer Group *

	All respondents to mail survey (Time 3)			
Variable Name	**LUDL (*n*= 127, Time 3 vs Time 2; *n*= 36, Time 3 vs Time 1)**	**LUDL/Staff (*n*= 105, Time 3 vs Time 2; *n*= 59, Time 3 vs Time 1)**	**Staff (*n*= 72, Time 3 vs Time 2; *n*= 67, Time 3 vs Time 1)**	***P*Value †**
Self-Efficacy ‡	4.93	5.36	5.36	0.09 §

Time 1				
Self-Efficacy Time 2	5.70	5.67	5.99	0.05 §
Self-Efficacy Time 3	5.82	5.83	5.99	0.38 §
Delta Self-Efficacy Time 3 - Time 1	+0.89 ‖	+0.42 ¶	+0.63 ‖	0.09 §
Delta Self-Efficacy Time 3 - Time 2	+0.12	+0.16 #	0.00	0.75 §
Outcome Efficacy ‡ Time 1	6.05	5.66	5.91	0.09 §
Outcome Efficacy Time 2	5.64	5.86	6.09	0.01 §
Outcome Efficacy Time 3	5.42	5.94	5.99	0.00 §
Delta Outcome Efficacy Time 3 - Time 1	-0.63	+0.28	+0.08	0.53 §
Delta Outcome Efficacy Time 3 - Time 2	-0.22	+0.08	-0.10	0.18 §
Behavior ‡ Time 1	4.04	4.01	4.17	0.41 §
Behavior Time 2	4.18	3.99	4.26	0.02 §
Behavior Time 3	4.31	4.30	4.37	0.79 §
Delta Behavior Time 3 - Time 1	+0.27	+0.29#	+0.20 #	0.69 §
Delta Behavior Time 3 - Time 2	+0.13 #	+0.31 §	+0.11 #	0.04 §

* Delta values are calculated as follows: Time 3 - Time 1, and Time 3 - Time 2 for outcome variables.

† *P* value (all *n*) for paired *t* test.

‡ See "Methods" for definitions of these composite variables.

§ Based on ANOVA comparing means of the three groups.

‖ $P < 0.001$ for Delta differing from b, using paired *t* test.

¶ $P < 0.01$.

# $P < 0.05$.

Discussion

Our findings provide reasonable support for the first hypothesis, that workers receiving training from peer trainers would demonstrate the greatest positive change in self-efficacy. In bivariate analyses (Tables 2 and 3) , LUDL-trained workers reported significantly greater improvement in self-efficacy

than staff or LUDL/staff-trained workers, and these findings were confirmed in multivariable analyses (Tables 4 and 5) . Moreover, the absolute level of change in self-efficacy among LUDL-trained workers appears quite substantial, approximately one full point on a five-point scale. It is notable that the greatest change in self-efficacy occurred during training (ie, between time 1 and time 2) with little further improvement between times 2 and 3. Nonetheless, it is important that the increases in self-efficacy were maintained once workers returned to their work settings. The findings also provide support for the hypothesized mechanism for this difference, ie, that LUDL-trained workers would perceive trainers as being more like themselves as compared with workers trained by others and thus would have a greater increase in the belief in their ability to carry out recommended behaviors. LUDL-trained workers were significantly more likely to identify with their instructors (Table 1) . In open-ended survey questions regarding why a worker did (or did not) identify with instructors, items mentioned most often were the instructor having similar interests, thoughts, concerns, beliefs, or opinions; the instructor being like the trainee-working class, ordinary person, UAW member; and the instructor having similar experiences, situations, problems, or background.

In contrast to hypothesis 1, our findings provide only weak support for hypothesis 2, ie, that workers receiving training from professional staff would demonstrate the greatest increases in outcome efficacy. The increase in outcome efficacy is greatest for this group at time 2 (Table 2) , but the differences are not statistically significant. In multivariable analyses (Tables 4 and 5) , again the staff-trained worker variable is associated with higher outcome-efficacy scores but only to a statistically significant extent as compared with LUDL/staff-trained at time 2. Differences at time 3 among the three groups are very small. It was expected that staff-trained workers would have greater increases in outcome efficacy because they would be viewed by workers as particularly knowledgeable about health and safety and thus have greater influence on workers' belief in the efficacy of outcomes. Our results do provide evidence that workers regard staff trainers as particularly knowledgeable about health and safety. When trainees were asked about

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TABLE 4 -- Linear Regression Models of Self-Efficacy, Outcome Efficacy, and Behavior, Immediately Posttraining (Time 2)*

Variable Name	Self-Efficacy Model	Outcome-Efficacy Model	Behavior Model
Self-Efficacy Time 1	0.5261 (<0.0001) †	NA ‡	NA ‡
Outcome Efficacy Time 1	NA ‡	0.4187 (<0.0001) †	NA ‡
Behavior Time 1	NA ‡	NA ‡	0.5935 (<0.0005) †
Climate	§	§	0.1096 (0.001) †
LUDL Trainer ‖	0.1064 (0.338) †	-0.1336 (0.335) †	-0.1442 (0.211) †
LUDL/Staff Trainer ‖	-0.2832 (0.002) †	-0.2345 (0.039) †	-0.2215 (0.002) †
Small Group Training Method ¶	-0.2627 (0.013) †	§	§

Large Group Training Method ¶	0.5169 (0.002) †	§	0.4231 (0.008) †
Flip Charts Used ¶	§	-0.2488 (0.019) †	§
Other Training Method ¶	§	§	0.2439 (0.002) †
Rate Setting Level 1 #	§	-0.5063 (0.314) †	§
Rate Setting Level 2 #	§	-0.3296 (0.061) †	§
Rate Setting Level 3 #	§	-0.2496 (0.021) †	§
Prior Training Level 1 **	§	§	-0.5089 (<0.0001) †
Prior Training Level 2 **	§	§	-0.2381 (0.022) †
Prior Training Level 3 **	§	§	0.01999 (0.034) †
Intercept $beta_o$	2.95	4.21	0.775
Adjusted r^2 for model	0.551	0.283	0.602

* $Y_1 = beta_o + beta_1 X_{1i} + beta_2 X_{2i} + beta_3 X_{3i} + ... + beta_p X_{pi} + e_i$.

† Coefficient (*P* value).

‡ Not eligible for entry in model.

§ Did not enter model.

‖ Reference group is trainer-type three-Staff Trainer.

¶ These variables represent individual training methods (ie, large group, use video/slides, small group, etc).

Level of Rating Setting: Level 1, poor; Level 2, fair; Level 3, good; Level 4, excellent. Reference Level is level 4.

** Level of Prior Training: Level 1, "None"; Level 2, "A little bit"; Level 3, "Moderate Amounts"; Level 4, "Quite a lot"; Level 4 is reference level.

their level of identity with their instructor, trainees trained by staff trainers identified least closely with their trainer on open-ended questions. Most frequently, these trainees responded that their reason for not identifying with their instructor was because they felt that their instructor was more educated/knowledgeable about health and safety than they were. The reasons why there was only a weak effect for outcome efficacy in the expected direction are not entirely clear. One element is that time 1 (pre-training) outcome-efficacy scores were relatively high and uniform, leaving limited room for improvement, which is reflected in the modest changes seen.

Our findings provide mixed support for the third hypothesis, ie, that LUDL-trained workers would demonstrate greater positive behavioral changes than staff-trained workers. Baseline reported behavior scores were rather high (approximately 4 on a scale of 5), and all three groups showed modest increases at time 3, with those among LUDL/staff-trained tending to be the greatest (Table 3) . In the multivariable regression, LUDL-trained workers appeared to be the least likely to improve behaviors, although differences were not statistically significant. Because self-efficacy increased more in LUDL-trained than in the other two groups, and differences in outcome efficacy were only slight, these results are somewhat surprising. They suggest that a model that could be expected to accurately predict change

in behavior may need to be more complex than the one presented, ie, that other unmeasured factors in addition to self-efficacy and outcome efficacy play a substantial role in behavior change. With respect to this, it is notable that in the "baseline" model in Table 4 , positive climate is a strong predictor of positive behavior. Also, those trainees who participated most frequently in health and safety committees reported behaving in a safe manner more of the time than trainees who participated less often. At the same time, there were some indications that LUDL-trained workers were more likely to change behaviors. Three months after the training, workers trained by LUDL trainers stated that they performed their job differently since the training more often than workers trained by LUDL/staff trainers or staff

TABLE 5 -- Linear Regression Models of Self-Efficacy, Outcome Efficacy, and Behavior, Three Months After Training (Time 3)*

Variable Name	Self-Efficacy Model	Outcome-Efficacy Model	Behavior Model
Self-Efficacy Time 1 †	0.4993 (<0.0001) ‡	NA §	NA §
Outcome Efficacy Time 1	NA §	0.5033 (<0.0001) ‡	NA §
Behavior Time 1	NA §	NA §	0.4682 (<0.0001) ‡
LUDL Trainer ‖	-0.0197 (0.885) ‡	-0.0150 (0.921) ‡	-0.2093 (0.117) ‡
LUDL/Staff Trainer ‖	-0.3053 (0.011) ‡	-0.010 (0.939) ‡	-0.0859 (0.412) ‡
Race (1 = white, 0 = non-white)	-0.7749 (0.001) ‡	¶	¶
Sex (1 = male, 0 = female)	-0.2945 (0.032) ‡	§	-0.2869 (0.024) ‡
Self-Efficacy Time 1-LUDL Trainer Interaction †	0.3286 (0.011)	NA §	NA §
Self-Efficacy Time 1-LUDL/Staff Trainer Interaction †	-0.0726 (0.552)	NA §	NA §
Intercept $beta_o$	7.05	3.01	2.78
Adjusted r^2 for model	0.432	0.261	0.309

* $Y_i = beta_o + beta_1 X_{1i} + beta_2 X_{2i} + beta_3 X_{3i} +...+ beta_p X_{pi} + e_i$.

† Variable entered in deviation units.

‡ Coefficient (*P* value).

§ Not eligible for entry in model.

‖ Reference group is trainer-type three-Staff Trainer.

¶ Did not enter model.

trainers, and this difference was statistically significant (results not shown). Workers trained by LUDL

trainers most often reported making an effort to improve health and safety as a result of training. In addition, workers trained by LUDL trainers most frequently claimed that training helped them "quite a bit" or "very much" in becoming more involved in health and safety activities. However, these differences were not statistically significant (results not shown). When asked open-ended questions about behavior-related variables, workers trained by LUDL trainers who reported being more involved in health and safety claimed that it was because they were more aware and had more information and greater confidence in their abilities more often than trainees in the other groups (results not shown). When asked about the types of actions they took to improve health and safety, workers trained by LUDL trainers reported that they formed/improved health and safety committees or became involved as activists (active role as a union member to promote health and safety) more often than workers trained by other trainers (results not shown). Overall these results imply that LUDL trainers appealed to trainees on a more personal level than other trainers and were most effective at changing workers' behaviors by supplying the knowledge and confidence required to make changes to improve health and safety conditions. However, this effect is limited, given the lack of impact on overall behavior scores seen in univariate and multivariate analyses.

The third type of trainer explored by this study was a combination of a LUDL trainer working with a staff trainer. Workers trained by LUDL/staff trainers identified closely with their trainers (Table 1) . However, of those trainees who identified closely, there was acknowledgment that their instructor was more knowledgeable about health and safety or came from a different environment than the trainee did (results not shown). It can be speculated that combining a LUDL (peer trainer) with a staff member therefore creates a complex identity issue for the trainee. Trainees in this group had the lowest changes in self-efficacy and outcome efficacy immediately after training (Table 2) . Three months after training, changes in self-efficacy were lowest, changes in behavior were the same as LUDLs, but changes in outcome efficacy were marginally greater for workers trained in this group (Tables 3 and 5) . These results suggest that combining trainer types decreased the potential for identification with trainers to impact efficacy values. Conceivably, there were some negative perceptions associated with the interaction of LUDL with staff trainers, although trainees were not asked questions exploring this possibility. It should be borne in mind that these differences across groups were relatively small and not completely consistent. For example, when asked about changes in health and safety-related behaviors since training, workers trained by LUDL/staff trainers reported an increase in their level of involvement in health and safety more often than workers trained by LUDL trainers or staff trainers (results not shown).

It should be noted that the number of potential trainers for each group was limited (approximately 12 LUDL trainers and four staff trainers). As a result, it is possible that findings were influenced by trainer personality as well as trainer status. However, the consistency of responses on the three main outcome variables (self-efficacy, outcome efficacy, and behavior) across training locations, which are specific to trainer type, suggests that results are reasonably generalizable (results not shown).

One strength of this study is the unusually high response rate for the

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mail survey (71%). According to Zelnio, [13] most bias tends to disappear when a response rate of 70% or more is achieved. The high response rate appears to be attributable to two main factors: (1) the high level of involvement for health and safety training felt by UAW members, and (2) the diligence taken during data collection (whenever possible, every trainee who did not respond within two weeks' time received a personal telephone call from the researcher, informing them of the importance of their honest responses). Another strength of this study is that there was an attempt to collect data over time so that

practically all trainees were questioned before, immediately after, and three months after training programs. This helped to establish a baseline and determine the true relationship between training factors and outcome variables. This study, therefore, goes beyond many other published studies that evaluate health and safety training but only collect data immediately after the training program.

Another strength of this study is the development of unique scales to measure outcome efficacy and self-efficacy for health and safety behaviors. Analyses indicated that these scales were good measures for determining respondent's levels of efficacy for health and safety behaviors in the workplace.

It is possible that this study was limited by the fact that workers were not randomly assigned to treatment groups. Although, when possible, a randomized design is preferred because it eliminates most potential for selection bias, this was not able to be done in this study because there was no control over how or when training sessions were organized or over who the trainers would be. However, given that this is an observational study, there are several strengths supporting the validity of the findings. First, data was collected at three points in time, including baseline data. Next, differences in baseline data were accounted for either by evaluating changes in scores on the main outcome variables over time, or including baseline scores as predictors of future scores in regression models. In all instances, key interaction terms in the regression models were investigated to take account of the possibility of different effects based on the differences in baseline values of the main outcome variables. For these reasons, it appears quite unlikely that selection effects meaningfully biased the findings.

An important potential weakness of this study is the lack of availability of baseline (time 1) data on a substantial subset of subjects. A decision was made to include these subjects to increase the power of the study for examining changes between the end of the training session (time 2) and 3 months later (time 3). In general, the results examining time 2 to time 3 changes are quite comparable to those examining time 1 to time 3 changes, offering reassurance this did not introduce substantial bias.

The findings of this study are that in this unionized occupational setting, peer trainers are most effective at raising a person's self-efficacy for performing health and safety behaviors, and, to a limited extent, professional union trainers appear effective at raising a person's outcome efficacy for performing those same types of behaviors. Mixed trainers (peer trainers combined with professional trainers) did not appear to be as effective in changing self-efficacy and outcome efficacy. The three types of trainers appeared to be about equally effective in promoting behavior change. Although in some settings there may be concerns with the quality of peer training as compared with professional training, the data in this study suggest that peer trainers actually perform better in some aspects (ie, raising self-efficacy) and certainly no worse in other key aspects (ie, major goal of behavior change) than professional trainers. These are important results that support the use of peer trainers as a very good strategy for the delivery of health and safety training.

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